made from material available to ancient Peruvians lasted only two minutes. Such flights would have required huge fires to inflate the hot-air balloon(s) and no "evidence of substantial fires has ever been recorded by surveyors or archaeologists."

But why were the lines made?

In one of his concluding statements about the people of ancient Peru, Hadingham writes that it "seems likely that mountain deities would have been the most prominent among a whole range of other venerated forces in their surroundings." And therefore the people of Nazca drew lines as "signals or acts of piety directed to the mountain spirits of the Andes."

Lines looks at ancient Peru in detail. Other mysteries examined include the ruins of Cahuachi and the Trident of Paracus. Perhaps the most amazing artifacts of ancient Peru are the remnants of the La Cumbre water system. Stone aqueducts, some as much as 70 feet high, can still be found snaking along the base of the Andes. "Designed to transport water some fifty miles . . . La Cumbre is thought to have absorbed two centuries of construction and a labor investment perhaps ten times that devoted to Egypt's Great Pyramid."

At times the author seems to move too far from the ancient ruins of Peru and into modern times, and he does not tie some of his topics together until the end of the book. But these are minor points and overall it is a wonderful book packed with science and history. The text is bolstered by 200 photographs, illustrations, and maps. For someone interested in any aspect of Peru, or in the Nazca lines, this book is a must. •

Nessie Without Sensationalism

The Loch Ness Monster: The Evidence. By Steuart Campbell. Aquarian Press, Wellingborough, North Hamptonshire, U.K., 1986. (Distributed in the U.S. by Sterling Publishing Co., Two Park Ave., New York, NY 10016.) 126 pp. Paper, £3.99.

George A. Agogino

THIS LATEST book on Nessie, the elusive and perhaps mythical creature that is believed to inhabit Loch Ness, has been written by Steuart Campbell, an Edinburgh writer and investigator. Unlike most previous books, which mixed folklore with possible fact, Campbell's is based on logic and reason rather than on sensational stories with little foundation.

Also unlike previous publications, which generally mirrored and often exaggerated Nessie reports, this book looks realistically at the evidence. Eyewitness accounts, photographs, movie strips, and sonar and radar scans are examined with the approach of a scientist. The result may disappoint Nessie buffs, but the books is based

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on substantiated fact and shows that there is no concrete evidence that Nessie ever existed. This type of book will not sell as well as one that sensationalizes rumor and half-truth regarding this "creature of the lake," but it is obviously not published for the writer's popularity; it is his search for truth. I respect him for his approach and for his conclusions.

Most books about Loch Ness start with the reported sighting of a "lake monster" in A.D. 665, when Saint Columba reportedly stopped it from devouring an unfortunate by evoking the name of the Lord. Steuart Campbell, while he mentions this incident, had refused to investigate any reports of sightings earlier than 1933, believing that such accounts could not be relied upon with any degree of accuracy.

However, although he dismisses these earlier reports, Campbell does return to the past to discuss the Kelpie, a water mammal generally resembling a horse or a cow that has been part of the folklore of Scotland for centuries. On calm days, pools and lakes reflect on their surfaces the trees and bushes of the shoreline and the clouds in the sky. It was easy for the Scottish Highlanders of past centuries to see another world, a duplicated world, similar to the real world, existing beneath the waters. The images of horses, cows, and deer coming to drink were reflected in the water and probably were the basis of the Kelpie legend. It was a simple step from this position to accept Nessie, the "monster of the Loch."

Campbell points out that the frequent sightings of the "creature of the lake" on the surface of the water suggests it is an air-breathing mammal or reptile. With this logic, one would expect that we would have clear photographs or movie strips of Nessie, since a road circles the lake and tourists abound with a variety of cameras. Yet no acceptable, clear shot has ever been taken of Nessie. Neither have its footprints coming from the lake ever been found, as reported in many accounts. It is this lack of clear evidence that detracts from the claims of those who strongly believe in Nessie. From my own standpoint, Nessie could not be a reptile, for the waters of the lake approach the freezing point much of the year. No reptile, unless it has developed some degree of warm-bloodedness, could possibly exist under these circumstances. Nor is the existence of the often-reported "sea cave" logical, for Loch Ness is considerably higher than sea level. If there were an unknown underground outlet to the sea, it would have drained the the lake to sea level.

After examination of all of the visual sightings, as well as photographic evidence, nothing concrete has ever been presented for science to examine. Most of these sightings, or photographs taken from a distance that show a snakelike neck and head cutting the surface of the lake, are simply the result of boat wakes. It is interesting that most of these sightings occurred on days when the lake was calm and boat wakes more pronounced. Many sightings can be clearly correlated to a local ice-

breaker that operates on the lake, since this boat leaves a pronounced wake during operation. In many of the photographs, the dark wake believed to be the "monster" is seen to be accompanied by smaller wakes when the film is enhanced. Inanimate objects, like long-submerged logs and decaying vegetation-mat, brought to the surface by gases formed by their disintegration, if properly combined, would clearly from a distance look like a head and neck—represented by the log—supported by a "body" of floating vegetation. Common animals of the area can also distort perception, especially during a search for Nessie. Geese swimming in a line in the distance might appear to be a multi-humped creature resembling something from the prehistoric past. Deer, horses, seals, and otters have all been known to swim in the lake and, at a distance or at dusk, could be gestalted into Nessie.

Author Campbell recognizes that individuals observing an event are not always accurate in recalling what they have seen. The phenomena of "sharpening" (seeing more than is there) and "leveling" (forgetting important details after a short period) must be taken into account in any investigation. Many individuals will also lie for publicity, financial gain, or simply for psychological satisfaction. Several people who have reported sighting Nessie are known "tricksters" or "practical jokers."

Dishonesty has also been attributed to some who claim to have "captured Nessie" on film. There exists no picture that clearly shows that there is really an unknown creature in Loch Ness. Perhaps the best are the Dinsdale photographs. The resulting 16-mm film when analyzed showed nothing concrete; the image may have been only a pronounced wake from a boat. Even Dinsdale was disappointed with the developed pictures. It is even possible that he simply photographed an otter, for he indicated white markings on the throat and cheeks of the "monster," a normal characteristic of the lake otters. Several photographs, seemingly of an unusual head appearing above the waters of the lake, are believed to show the tail of an otter in the act of diving for fish. Underwater photographs have little potential, because the lake is murky and, even with lights, visibility below the surface is limited. Even if a camera were to have a close encounter with Nessie, only a part of the creature would be captured on film because there simply are no lights available that would enable the entire creature to be photographed if it had any size at all.

Sonar and radar seem to have the best potential. However, it has turned out that this evidence, at first suspected of being convincing, was poorly interpreted, and today there is no sonar evidence that Nessie exists. Radar has been a failure as well. It is admitted that hydrophones have picked up strange sounds at times, but it is suspected these are of mechanical origin. No echo signals, such as a creature might need to guide his movements in this murky water, have ever been recorded. In fact, in conclusion the author feels sure that Nessie, or as he calls it, "N," does not exist in Loch Ness. He even goes so far as to claim the nonexistence of other lake monsters reported throughout the world.

At this point I must mention my own experience with a "monster" in Lake Senteni, New Guinea. I was placed on detached service during World War II for sensitive work with the natives in this area. I used a dugout to visit islands in this lake, and listened to the natives' tales of "monsters" there. I didn't believe them, but one day while using hand grenades to kill fish for the natives, I surprisingly stunned a bull shark. The incident was later reported by Bernard Heuvelmans, using my information, in a paper published in a French magazine. This was believed at the time to be the second purported occurrence of sharks in a fresh-water lake cut off from the sea. Later, other investigators found swordfish in the same lake and bull sharks in nearby Lake Jall. In this case, the lakes are almost at sea level and close to

the ocean, and during the rainy season they spill over into riverlets that flow to the sea. It is suspected that during these periods, smallfry of these fish left the ocean for the relative protection of the lakes, adjusted to the fresh water, and eventually grew too large to return to the sea. I mention this since it is another example of "lake monsters" that have a logical origin and, while somewhat out of place, are known fish in an unusual habitat.

In conclusion, Campbell's *Loch Ness Monster: The Evidence* is perhaps the best book yet presented on the "creature of Loch Ness," for it disregards hearsay evidence and folklore and demands concrete proof before the claim of "Nessie" is accepted by science. •

Some Recent Books

Hines, Terence. *Pseudoscience and the Paranormal: A Critical Examination of the Evidence.* Prometheus Books, Buffalo, N.Y., 1988. 372 pp. $19.95, paper. Intended as a text and reference volume for a course on parapsychology and the occult, this valuable volume fulfills that goal admirably, but is more than that. It is a readable, up-to-date (some of the references are to 1988 publications), and carefully prepared synthesis of the latest scientific/psychological studies and perspectives on virtually every topic of interest to observers of paranormal claims and of fringe-science and pseudoscience. Especially agreeable is the emphasis throughout on marshaling the latest knowledge of psychology to help readers understand how unusual-seeming experiences can be misinterpreted as evidence of paranormal events. Should be on the bookshelf of every skeptic and scientist interested in these subjects.

Strahler, Arthur N. *Science and Earth History: The Evolution/Creation Controversy.* Prometheus Books, Buffalo, N.Y., 1987. 552 pp. $39.95, hardcover. A massive work (54 chapters divided into nine sections) by a noted professor and author of earth-science texts, outlining in some detail our present knowledge about the history of the earth and assessing and contrasting the claims of creationists in light of it. The author says his mission "is primarily to explain what natural science is all about and how scientists go about doing it. The debate between creation scientists and mainstream scientists is an ideal vehicle for carrying out that mission." As an intended reference tome on the creation/evolution controversy and all related scientific and philosophical issues from an earth scientist's viewpoint, this work may be hard to top.

—*Kendrick Frazier*